

Do we know our students?: Analyzing Piagetian stages of cognitive development with a paper-pencil instrument

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Piaget introduced his biologically motivated work early in the last century, and from that time to today, educators and researchers have eagerly worked to exhibit a link between students' development level and their capacity for learning (Markwell & Courtney, 2006). According to Cohen and Smith-Gold (1978), the two levels which most college students are operating are concrete operations and formal operations. However, Pascarella and Terenzini (1991) stated that evidence suggests that close to half of entering college students are not operating at advanced stages of cognitive development and that postsecondary education plays a key role in exposing students to experiences that encourage development. Woolfolk (2007) stated, "Some students remain at the concrete operational stage throughout their school years, even throughout life. However, new experiences, usually those that take place in school, eventually present most students with problems they cannot solve using concrete operations" (p. 35). The implication that students, regardless of education level, are not reaching the formal operation level is one that our education system is not significantly contributing to the intellectual development (abstract logical reasoning) of our students (Arons & Karplus, 1976). In assessing cognitive abilities to determine an individual's cognitive stage, Piaget created a series of tasks administered in a one-on-one setting. In order to simplify the process of assessment of cognitive stage, a paper-pencil instrument was developed by Bakken and administered to 279 students ranging from third to twelfth grade (Bakken, Thompson, Johnson & Dwyer, 2001; Dunn, 2006). The two research questions guiding research this study were: (1) Is a paper-pencil instrument valid and reliable to measure Piaget's stages of cognitive development for undergraduate students? (2) Does a sample undergraduate class align with previous findings regarding Piaget's stages of cognitive development for undergraduates?

Theoretical Framework

Piaget's Theory of Cognitive Development purports that Concrete Operations and Formal Operations are the highest stages of cognitive development and that learners reach the uppermost stage by age 15. Substages of Concrete Operations and Formal Operations can be studied in Cowan (1978). Piaget did not believe that individuals advance one distinct step at a time through the stages, nor that progress was automatic (Piaget, 1964). In fact, Piaget suggested that cognitive development be viewed as a continuum involving the interaction of four factors including: maturation, active experience, social interaction, and a general progression of equilibrium (Piaget, 1961). There is a fixed element to Piaget's theory: every student must pass through the stages of cognitive development in the same order with rates of passing varying according to experiential and hereditary factors (Wadsworth, 2004).

Methodology

The Bakken Test of Piagetian Stages (1995) was utilized to measure stage of cognitive development and consisted of 21 multiple-choice questions composed of Piagetian tasks (e.g. conservation of numbers, area, liquid, length, weight and volume). Other items include problem-solving items involving classification, right-left relationship, perspective-taking, reasoning, and logic. Dunn (2006) analyzed the results of previously collected data from the primary student and secondary student populations with the instrument and found Bakkan's Test of Piagetian Stages to be valid and reliable. An Education Policy and Leadership class was selected as the pilot test group as a convenient, accessible sample. The students were asked to complete the Bakken (1995) paper-pencil-test.

Findings

The sample of 19 students was 46% male and 53% female with a mean age of 22.38 years. In Table 2, the Piagetian stages of cognitive development as determined by the Bakkan (1995) instrument are presented.

Table 2: Frequency of Piagetian stage of cognitive development

<i>Stage of Cognitive Development</i>	<i>Frequency</i>	<i>Percentage</i>
Concrete sub1	1	5.3
Concrete sub2	10	52.6
Concrete sub3	3	15.8
Formal sub1	4	21.1
Formal sub2	0	0
Formal sub3	1	5.3

Note: Substages further described in Cowan (1978)

Conclusions

In response to research question one, the instrument was determined to have content validity by a panel of experts while face validity was determined by a field test with a like audience. Reliability of the instrument is currently under further investigation. In response to research question two, the findings show that 73.7% of students were at the Concrete Operation Piagetian stage of cognitive development, aligning with Pascarella and Terenzini's (1991) assertion that close to half of entering college students are not operating at advanced stages of cognitive development. The findings also align with Cohen and Smith-Golden's (1978) assertion that paper-pencil tests of cognitive tasks, "at Metropolitan State College, an inner-city, open-door, four-year institution, indicated that more than 75 percent of students entering the college had not reached the level of Formal Operations" (p. 32).

Recommendations

Additional studies should be conducted to further investigate the reliability of this instrument in measuring Piagetian stages of cognitive development with post-secondary students. Studies comparing different post-secondary populations' Piagetian stages of cognitive development should be conducted. Specific teaching strategies designed to develop

undergraduate cognitive sages should be studied. Professional development seminars should be taught that to help instructors teach their students in ways that both address their current stage of development, and assist in their further cognitive development.

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